Non-Narcotic Pain Management Options

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Objectives

- Increase awareness of a multimodal approach in the treatment of pain
- Understand an interventional diagnostic approach to evaluating pain
- Understand common interventional treatments available for the treatment of pain

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Epidemiology

- Pain second most common complaint to seek medical advice
- <3 hours training of primary care physicians
- 60-90% US adults will have back pain in their lifetime, 50% annual incidence
- 30% with back pain develop chronic pain

Skovron ML: Epidemiology of low back pain. Bailliere's Clin Rheum 6:559-573, 1992.

Epidemiology

- "The annual cost of chronic pain in the U.S. is estimated to be $560-635 billion including health care expenses and lost productivity"
- Most frequently filed Workman's Compensation claim
- Most common reason for disability in patients <45 years

Institute of Medicine. *Relieving Pain In America: A Blueprint for Transforming Prevention, Care, Education and Research.* Washington, D.C.: The National Academies Press. 2011.

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ESTIMATED EPIDEMIOLOGY OF SPINAL PAIN

	Low Back	Neck
IDD/DDD	**20-50%**	**20-30%**
Facet joint mediated pain	**15-45%**	**50-60%**
Disc herniation	**3-46%**	**3-50%**
Spinal stenosis	**2-12%**	**2-15%**
Myofascial	**10-20%**	**10-20%**
Other causes	**2-10%**	**2-10%**

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CDC 2016 Recommendation #1 article quote

- Patients should receive treatment with greatest benefits relative to risks
- Nonpharmacologic therapies, including physical therapy, weight loss for knee osteoarthritis, psychological therapies such as CBT, and certain interventional procedures, can ameliorate chronic pain
- Multimodal therapies should be considered for patients not responding to single-modality therapy, and combinations should be tailored depending on patient needs, cost, and convenience.
- If opioids are used, they should be combined with nonpharmacologic therapy and non-opioid pharmacologic therapy, as appropriate, to provide greater benefits to patients in improving pain and function.

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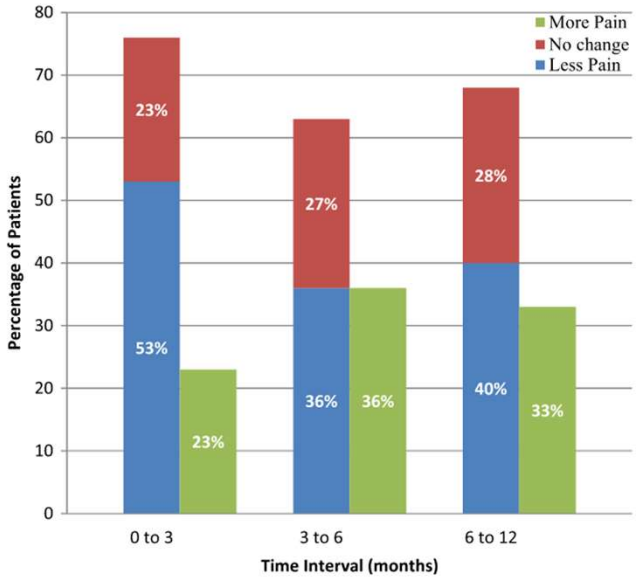
Interventions and non-opioid treatments actually decrease pain in most



Clinical Implications of Tapering Chronic Opioids

Table 3 Opioid regimen in patients successfully and unsuccessfully tapered

Opioid Regimen	Successful Taper	Unsuccessful Taper
Fentanyl Transdermal + Oxycodone IR	1	1
Methadone	4	
Methadone + Morphine IR	2	
Methadone + Oxycodone IR	10	
Morphine SA + Morphine IR	7	2
Morphine SA + Oxycodone IR	15	
Oxycodone IR	5	
Oxycodone SA	1	
Oxycodone SA + Morphine IR	1	
Oxycodone SA + Oxycodone IR	1	
	47	**3**

IR = Immediate Release; SA = Sustained-Acting.

"The aver[illegible] percent reduction of opioid doses was 46% over a 12-month period."
Harden P et al. **Clin[illegible]plications of Tapering Chronic Opioids in a Veteran Population**
Pain Medicine 2015

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CDC 2016 article quote

- Several guidelines agree that first- and second-line drugs for neuropathic pain include anticonvulsants (gabapentin or pregabalin), tricyclic antidepressants, and SNRIs.
- Interventional approaches such as epidural injection for certain conditions (e.g., lumbar radiculopathy) can provide short-term improvement in pain.
- Epidural injection has been associated with rare but serious adverse events, including loss of vision, stroke, paralysis, and death.

Wallen M, Gillies D. Intra-articular steroids and splints/rest for children with juvenile idiopathic arthritis and adults with rheumatoid arthritis. Cochrane Database Syst Rev 2006:(1):CD002824.
Bellamy N, Campbell J, Robinson V, Gee T, Bourne R, Wells G. Intraarticular corticosteroid for treatment of osteoarthritis of the knee. Cochrane Database Syst Rev 2006;2:CD005328.
Buchbinder R, Green S, Youd JM. Corticosteroid injections for shoulder pain. Cochrane Database Syst Rev 2003;1:CD004016.
Food and Drug Administration. Epidural corticosteroid injection: drug safety communication. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2014

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Initial Evaluation

- History and physical exam
- Prior treatment/interventions
- Diagnostic studies

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History

- Where (Primary location? Radiation?)
- When (Worst/best)
- Duration
- Prior events
- Character
- Severity
- Associated symptoms

Physical Exam

- General physical condition
- Inspection (scoliosis, kyphosis)
- Palpation
- ROM
- Strength
- Sensation
- Gait
- Reflexes
- Provocative maneuvers
- Waddell signs

Diagnostic Studies

- Plain films
- MRI
- CT
- Myelogram
- Bone Scan
- EMG

Asymptomatic Abnormalities

- Disc Degeneration (Bulging) 50%
- Disc Protrusion 30%
- Disc Extrusion 1%
- Facet Arthropathy 10%
- Spinal Stenosis 21%

Spinal Pain

- Radicular
  - Inflammation of nerve root
- Axial
  - Myofascial
  - Facetogenic
  - Discogenic

Initial Treatment

- Analgesics
- Muscle relaxants
- Chiropractic care
- Physical therapy
- 4-6 weeks prior to injections
- EXCEPT if to facilitate more conservative treatment

Radicular Pain vs. Radiculopathy

- Radicular pain in distribution of nerve secondary to inflammation
- Radiculopathy is specific neurologic deficit
  - May be painless

Inflammation and Radicular Pain

- Macnab I, *Pain*, 1971: Balloons in neural foramina of normal nerves and those with associated disc herniations
  - Normal levels produced painless neuro deficits
  - Affected levels produced pain

Inflammation and Radicular Pain

- Lindahl and Rexed. *Acta Orthop Scand*, 1951: Histologic evidence of inflammation in patients undergoing discectomy
- McCarron et al. *Spine*, 1987: Biologic and histologic evidence of intense inflammation involving dura and nerve roots after injection of autologous nuclear material to epidural space

Inflammation and Radicular Pain

- Saal et al. *Spine,* 1990: High levels of PLA2 at interface of epidural space and disc herniation in patients with radiculopathy
  - PLA2 is normal constituent of nucleus pulposus
  - Active component of inflammation
  - Acts on cells membranes to release arachidonic acid

Inflammation and Radicular Pain

- Nygaard et al. *Spine,* 1997: LTB4 and TXB2 present in lumbar discs at time of surgery for herniation
  - Leukotrienes and thromboxanes capable of direct nociceptive stimulation
- Chen et al. *Spine*, 1997: PLA2 injected into epidural space leads to demyelination and ectopic discharge

Annular Damage (fissure, tear, herniation)

Escape of nuclear material

Inflammatory reaction

Nociceptor activation

Potential nerve injury

Subsequent pain

Corticosteroids

- Inhibition of leukocyte aggregation
- Prevention of degranulation of granulocytes, mast cells, macrophages
- Stabilization of lysomal membranes
- Inhibit PLA2 activity and the AA cascade

Epidural Steroid Injections: Indications

- Radicular Pain
  - Disc Herniation
  - Herpes Zoster
- Spinal Stenosis
- Discogenic Pain (?)

Epidural Steroid Injection

- Three routes:
- Caudal
- Interlaminar
- Transforaminal

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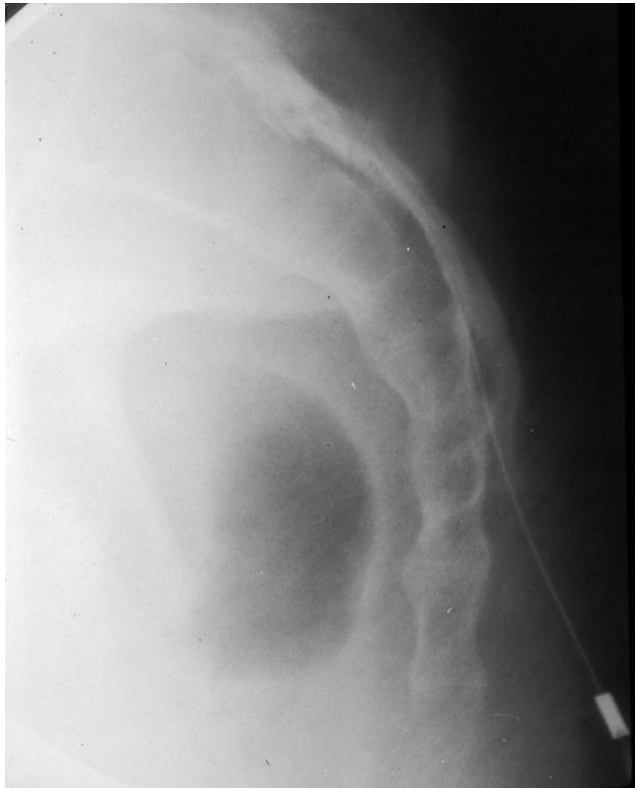
Technique ESI

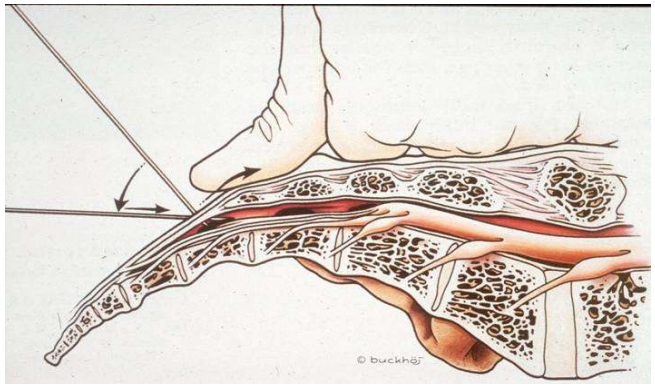
- Fluoroscopic guidance recommended
  - Up to 40% blind **Caudal** injections are improperly delivered (location)
  - Up to 20% blind epidural injections are improperly delivered (location)
  - 10% vascular uptake despite negative aspiration

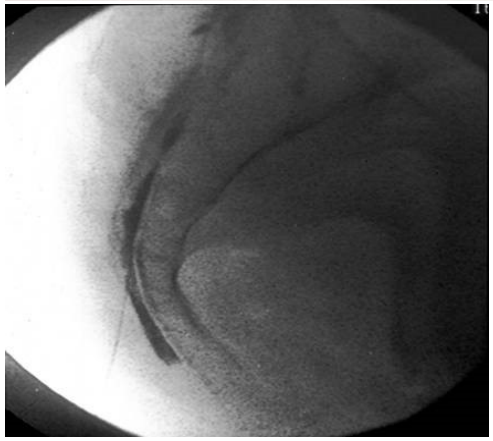
Stitz MY, Sommer HM. Accuracy of blind versus fluroscopically guided caudal epidural injections. Spine 24:1371-1376,1999

Fredman B, Nun MB, Zohar E et al. Epidural steroids for treating "failed back syndrome" Is fluoroscopy really necessary? Anesth Analg 88:367-372,1999

Caudal ESI







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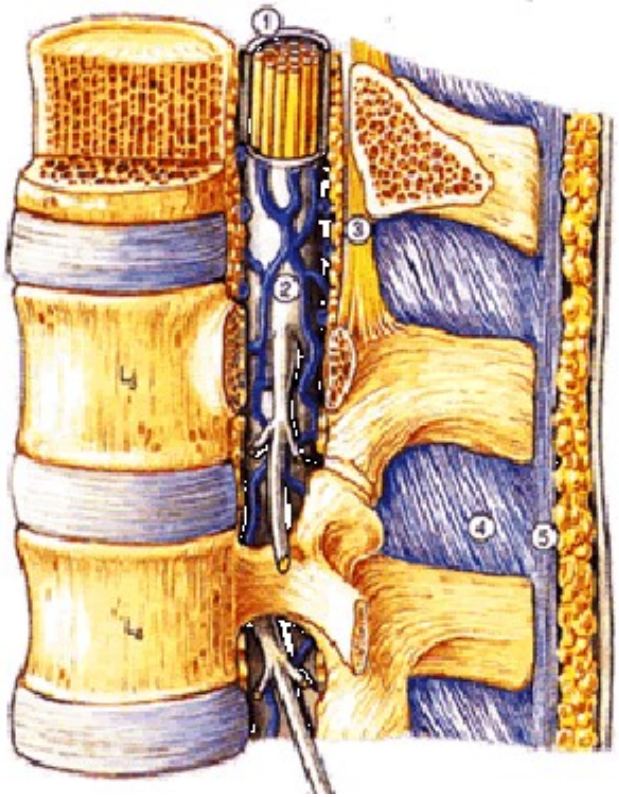
Caudal ESI

- Advantages:
  - Lesions at or below L4-5
  - Post-laminectomy
- Disadvantages:
  - Ineffective above L4-5
  - Larger volumes required

Interlaminar ESI

- Cervical
- Thoracic
- Lumbar



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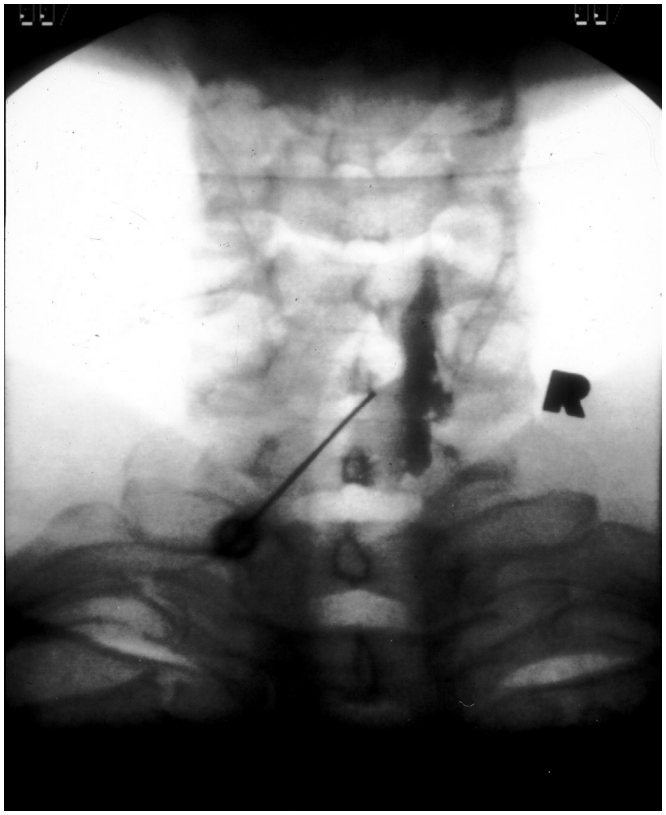
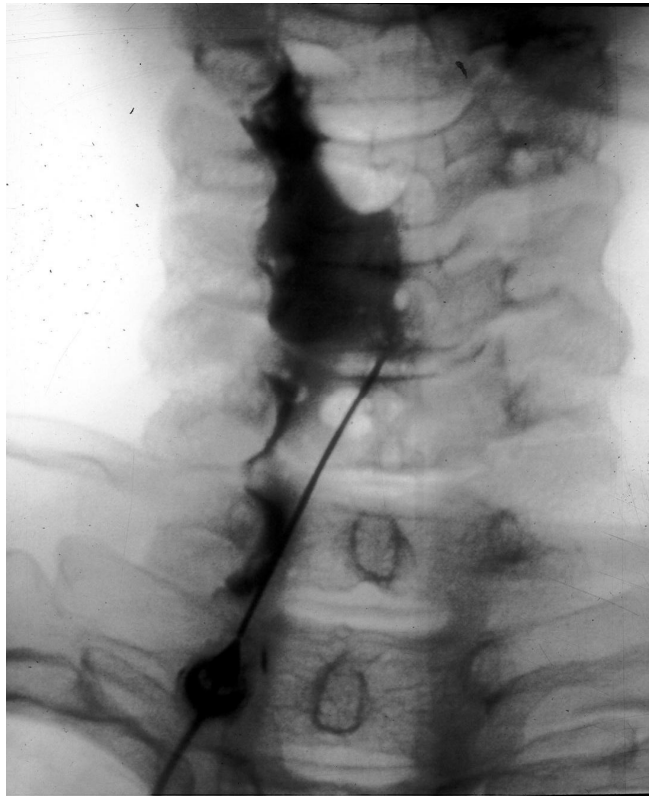
Cervical Interlaminar ESI

- Interlaminar safer below C6-7
- Ligamentum flavum frequently incomplete above C6-7 in midline
- T1-2 widest posterior epidural space
- Catheter-directed techniques frequently employed

Cervical ESI





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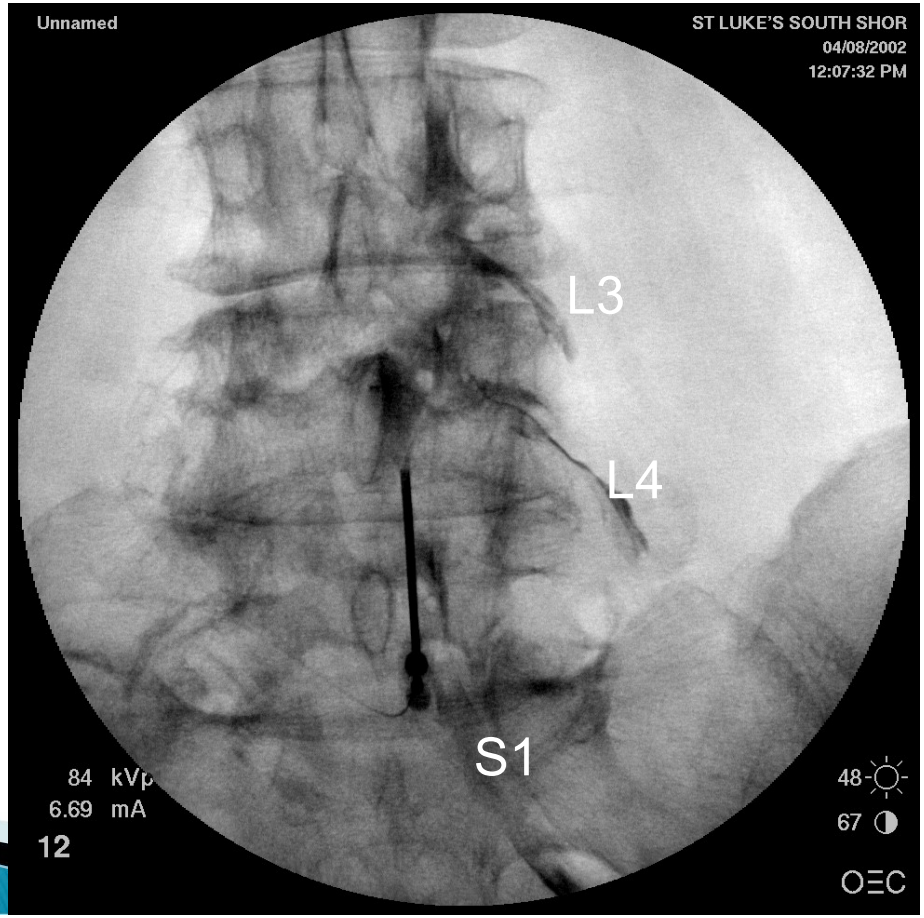
Interlaminar ESI



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Transforaminal ESI

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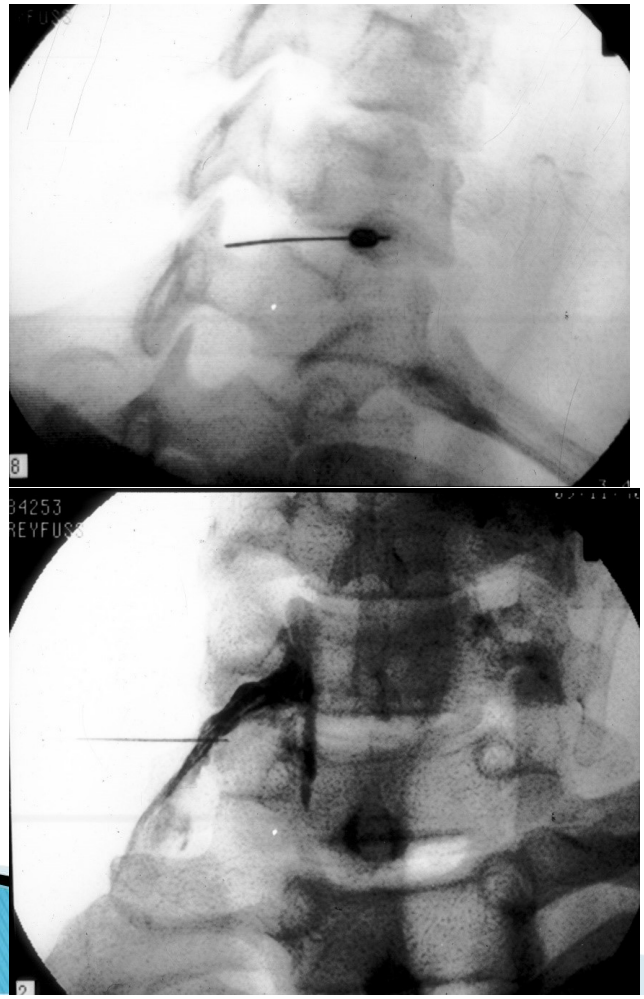
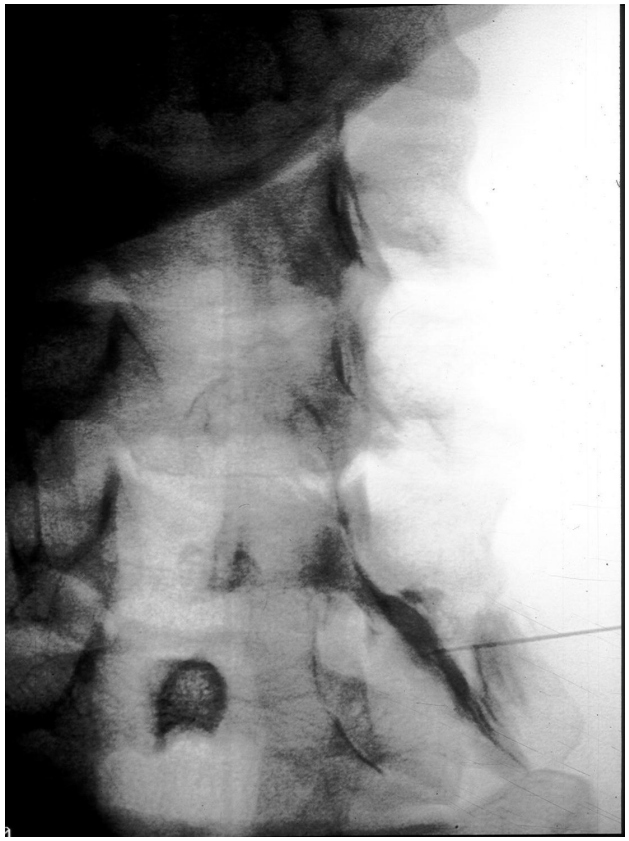
Transforaminal Cervical ESI





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Transforaminal Lumbar ESI

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Complications and adverse effects

- Headaches
- Infection
- Bleeding
  - Coumadin Ticlid, Plavix, Asprin, Lovenox, Etc…
- Paraplegia
- Nerve root injury
- Miscellaneous
  - Increased Blood Sugar
  - Hypertension
  - Pedal Edema, CHF

Controversies 1,2 or 3 ESI?

- Evaluate response after each ESI
- Wait at least two weeks between ESIs due to suppression of Hypothalamic-pituitary axis

Bogduk N. Spine update Epidural steroids Spine 20:845-8,1988

Cicala RS, Westbrook A, Angel JJ. Side effects and complications of cervical epidural steroid injections. J Pain Sympt Manag 4:64-6,1989

ESI Efficacy

- Manchikanti et al: Double blind, randomized placebo controlled studies evaluating ESI for treatment
  - -Chronic discogenic pain
  - -Chronic radiculitis
  - -Lumbar post laminectomy syndrome
  - -Spinal stenosis

Manchikanit L, Singh V, Cash KA, et al.: Preliminary results of a randomized , equivalence trial of fluoroscopical caudal epidural steroid injections in managing chronic back pain. Pain Physicinan. 11:801-848 2008

ESI Efficacy

- Manchikanti et al:
  - Demonstrated efficacy in all 4 groups with functional improvement noted in:
    - Disc herniation and radiculitis group (79-91%)
    - Post laminectomy syndrome (55%)
    - Spinal stenosis (70%)

Cervical ESI-Efficacy

- Lin E et al. *AAOS Annual Meeting,* 2005:
  - 70 patients with cervical disc herniations, failed conservative therapy
  - 63% sufficient or total relief to avoid surgery
  - 414 days relief
  - Average 1.46 injections

Herniated Nucleus Pulposus

- With (1.8) transforaminal steroid injection, 75% of patients (N=69) had good outcomes at 80 weeks
- Transforaminal> Interlaminar> Caudal
- Cost Effective

Lutz GE, Vad VB, Wisneski RJ. Fluroscopic transforiminal lumbar epidural steroids: An outcome study. Arch Phys Med Rehabil 79:1362-1366,1998

Manchikanti L, Pakanati RR, Pampati V. Comparison of three routes of epidural steroid injections in low back pain. Pain Digest 9:277-285,1999

Zennero H, Dousset V, Viaud B et al. Periganglionic foraminal steroid injections performed under CT control. AJNR Am J Neuroradiol 19:349-352,1998

Manchikanti L. Focused review: Transforaminal lumbar epidural steroid. Pain Physician. 3:374-398,2000

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Efficacy Transforaminal ESI Lumbar

- 30 patients
- Average follow up 3 years (1-10 years)
- 46% complete pain relief
- 23% average pain relief
- 20% had surgery

Weiner and Fraser JB JS 1997

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AHRQ Guidelines

- 74 articles screened, 9 RCT's met criteria for review (6 pro, 3 con)
- "ESI are an option for short term relief of radicular pain after failure of conservative treatment and as a means of avoiding surgery"

ESI Evidence

- "The greatest limiting factor to generating Class A evidence for ESIs has been the widespread acceptance of ESIs as a therapeutic intervention. Because ESIs are so accepted, many researchers have had difficulty enrolling subjects into a study where a placebo injection is a possibility"

Chekka K, Benzon HT, Molloy RE. (2011). Interlaminar epidural steroid injections for lumbosacral radicular pain. In Benzon, Raja, Fishman Liu & Cohen (Eds.), Essentials of Pain Medicine (307-312). Philadelphia, PA: Saunders.

Question…

What role does imaging play in the diagnosis of chronic axial low back pain?

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Imaging in Chronic Axial Back Low Pain

- MRI correlates poorly with source of pain

  Boden SD et al, JBJS,72: 403-8, **1990**

  Jensen M et al, N Eng J Med, 331:69-73, **1994**

  Boss N et al, Spine 20: 2613-25, **1995**

  Yu SW et al. Am J Neuroradiol 10:1077-81, **1989**

- CT correlates poorly with source of pain

  Schwarzer AC et al, Spine, 20:907-912, **1995**

  Weisel et al, The incidence of positive CAT scans in an asymptomatic group of patients. Spine, (9), 549-551, **1984**

  Rothman RH. The study of computer assisted tomography, Spine 9;548,**1984**

- X-ray correlates poorly with source of pain

  Jajic I et al, Clin Rheumatol 6:39-41, **1987**

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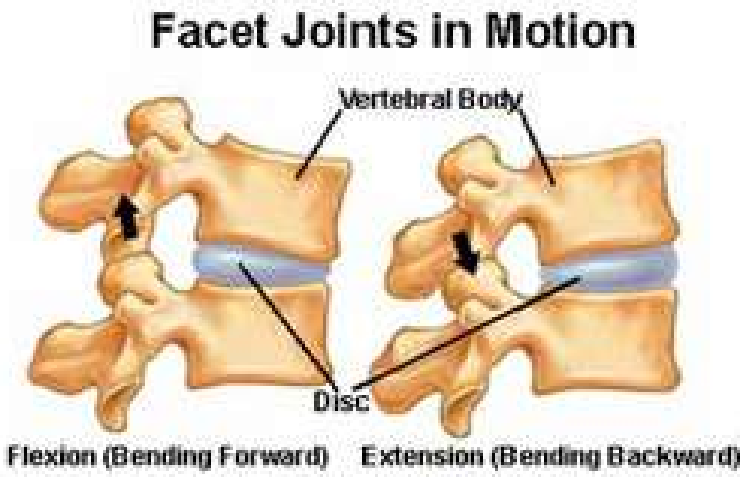
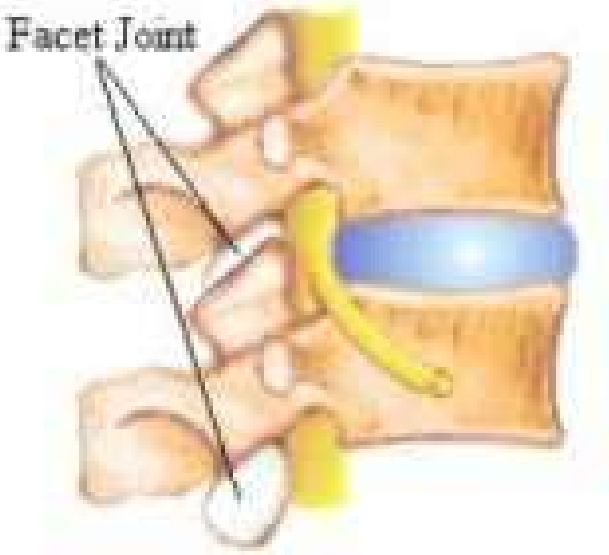
Spinal Facet Joint





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Cervical Pain: Facets

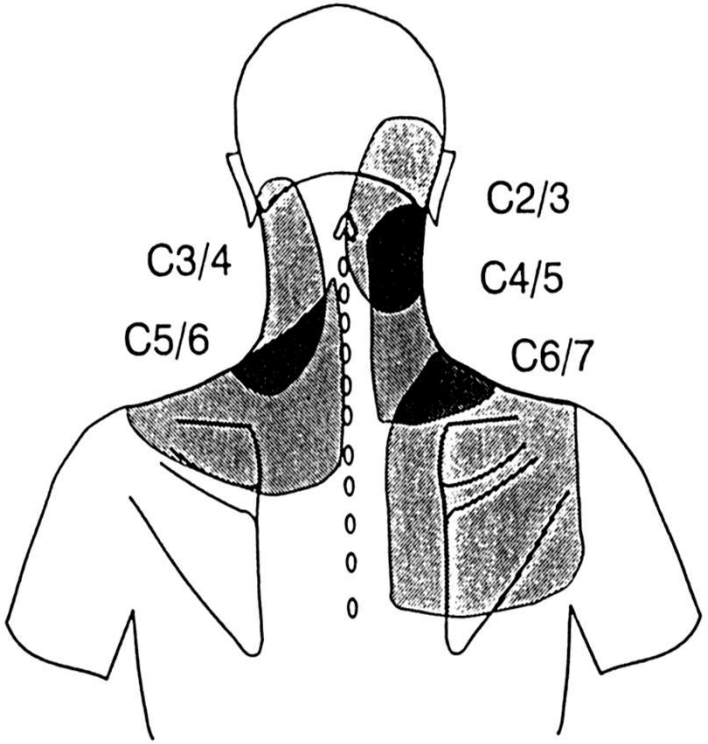

Figure 1. Maps showing the typical distribution of pain referred from each of the cervical zygapophysial joints when stimulated in normal volunteers (modified from Dwyer et al[20]).

- Stimulation of zygapophyseal joints causes pain in normal volunteers
- In patients with neck pain produces relief with anesthetizing joints

Dwyer et al Spine 15:453-457,1990
Bogduk Spine 7:319-330,1982
Wedel & Wilson. Reg Anesth 10:7-11,1985
Dussault & Nicolet. J Can Assoc Radiol 36:79-80,1985

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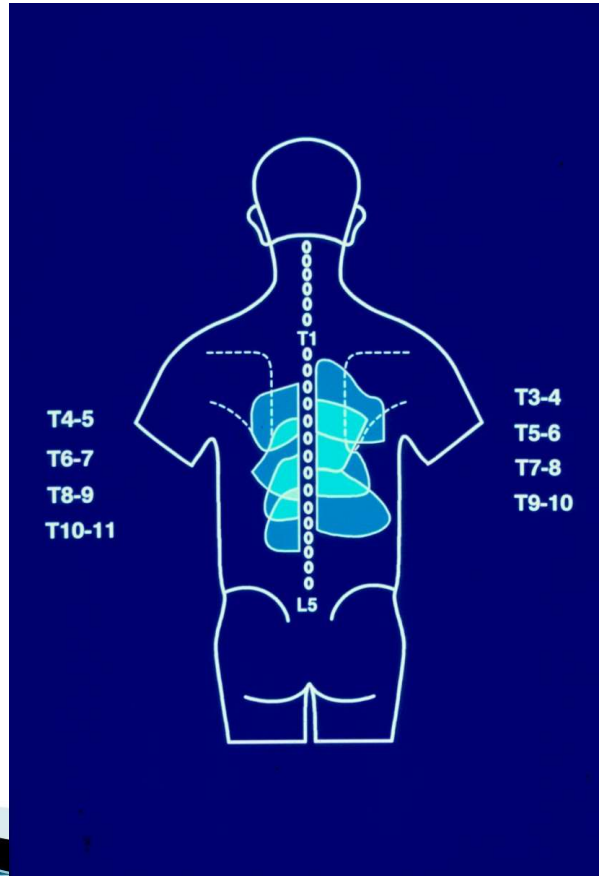
Thoracic Facet Pain Pattern



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Facet Referred Pain

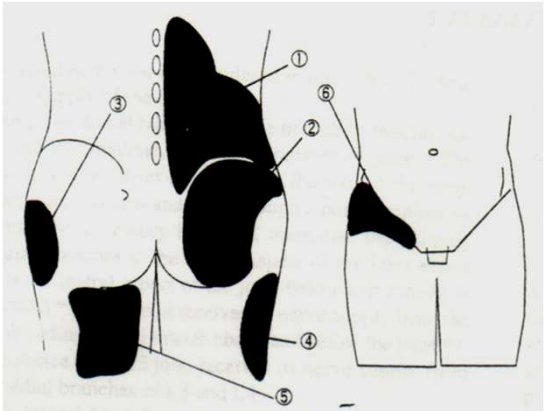

FIG. 1. Referred pain distribution. 1, lumbar spinal region; 2, gluteal region; 3, trochanter region; 4, lateral thigh region; 5, posterior thigh region; 6, groin region.

Gluteal
Trochanteric
Proximal thigh
Groin
Lumbar
Considerable overlap

Fukui s, Ohseto K, Shiotani M, Ohno K, Karasawa H, Naganuma Y. Distribution of referred pain from lumbar zygapophyseal joints and dorsal rami. Clin J Pain 13:303-307,1997

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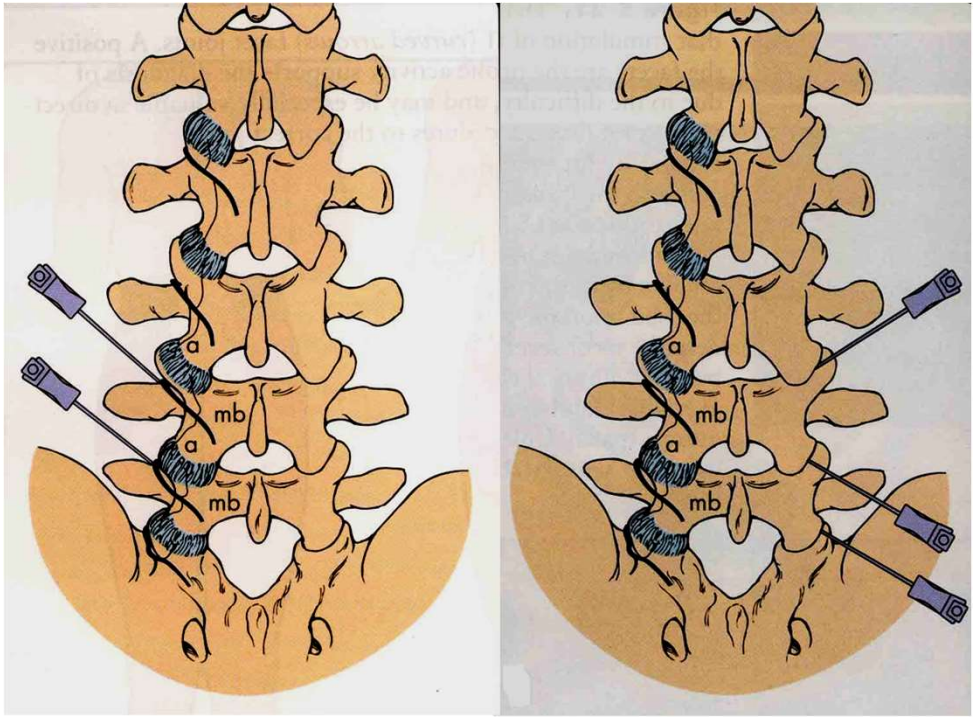
Diagnosing Facet Syndrome



Neither clinical examination nor Imaging is reliable for diagnosis

Schwarzer A, [illegible] R, Aprill CN et al. Pain from lumbar zygapophyseal joints. A test of two models J Spin[illegible] 7:331-8:1994

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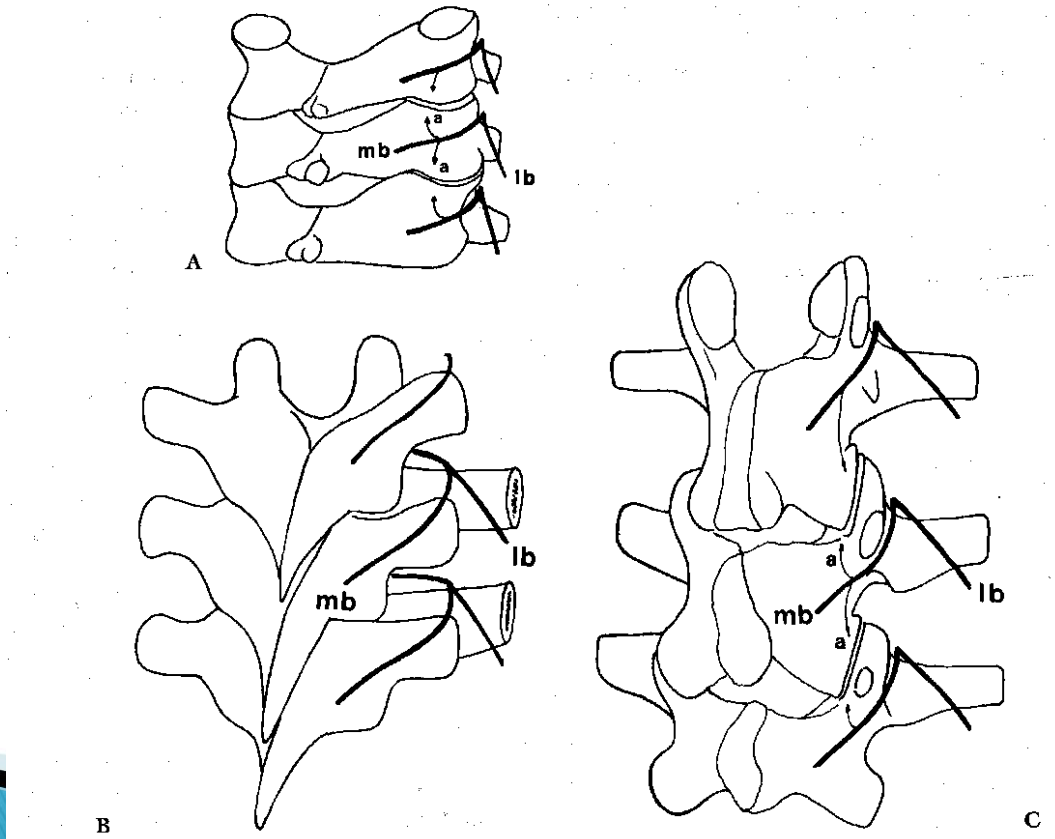
Medial Branch Block



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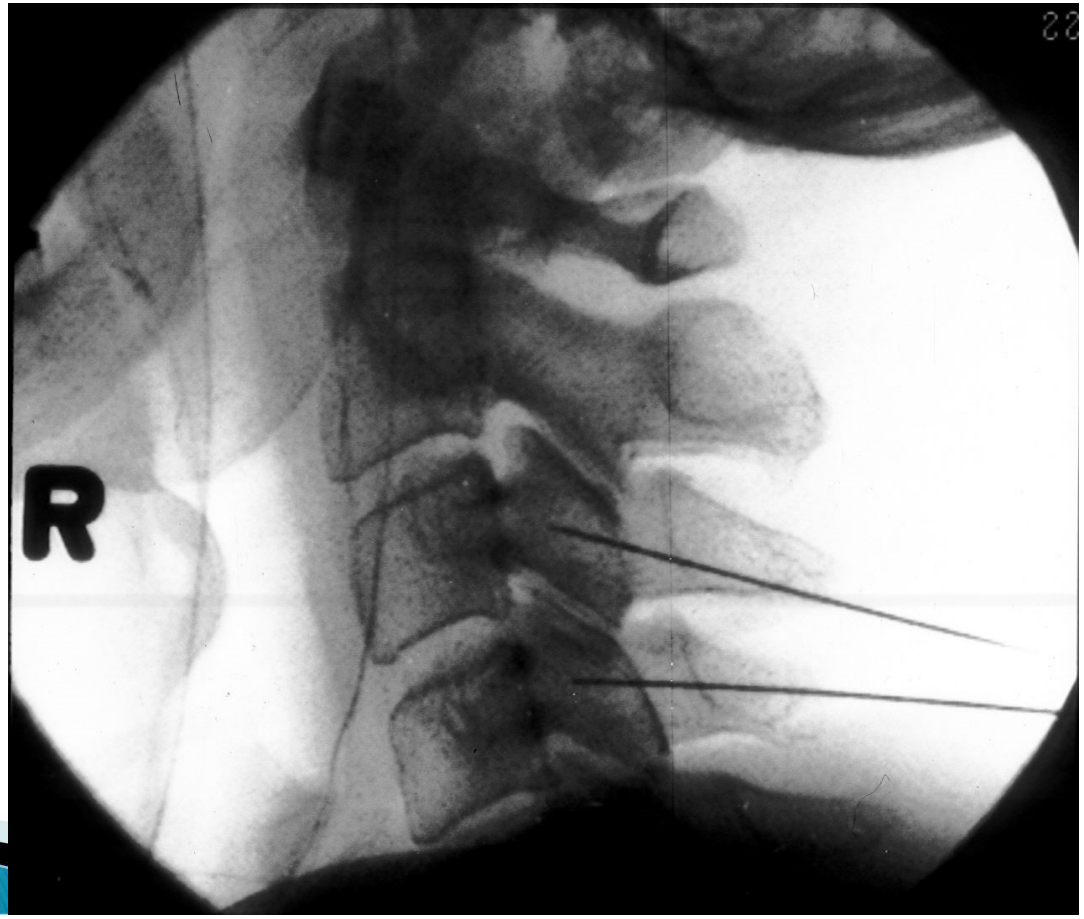
Medial Branch Block



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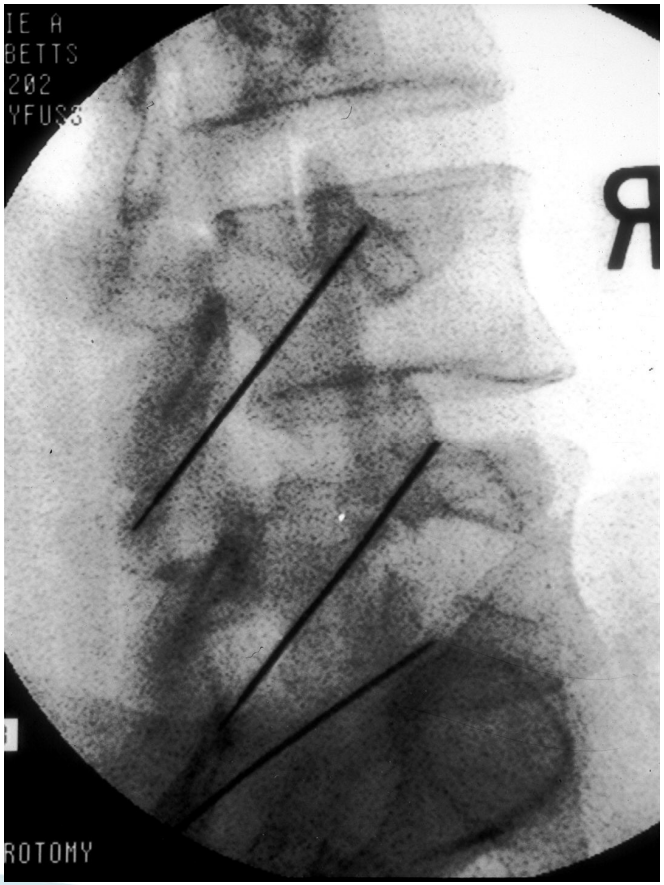
Lumbar Facet RF



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Radiofrequency Ablation

- Radio frequency ablation medial branch provides most definitive treatment
- 60% of patients > 90% relief, 87%>60% relief at 12 months. (Dual comparative anesthetic blocks)

Dreyfuss P, et al. Efficacy and validity of radiofrequency neurotomy for chronic lumbar zygapophysial joint pain. Spine 25:1270-7,2000

- 253 days before 50% pre RF symptoms returned

Lord SM, et al. A randomized double blinded controlled trial of percutaneous radiofrequency neurotomy for the treatment of chronic cervical zygapophysial joint pain. N Engl J Med 335:1721-1726,1996

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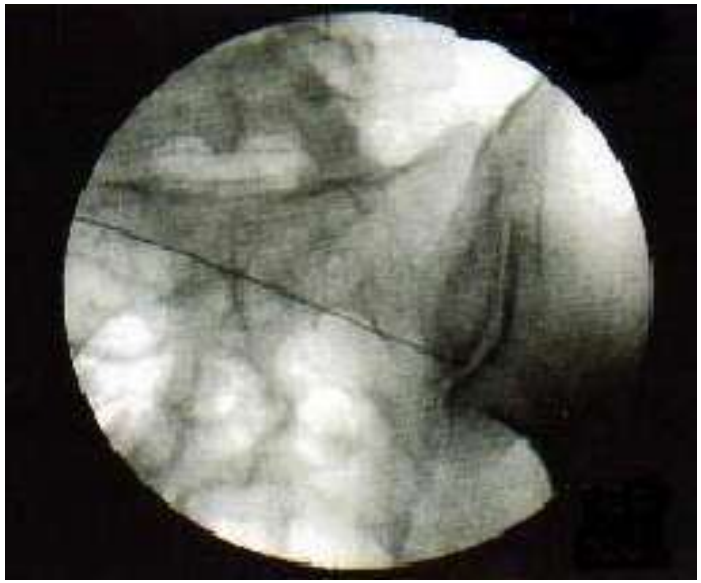
SI Joint Dysfunction

- Incidence 12%
- Diagnostic and possibly therapeutic fluoroscopic injection with arthrography

Maigne et al. Spine 21:1889-92,1996
Schwartzer et al. Spine 20:31-37,1995

SI Joint Injection



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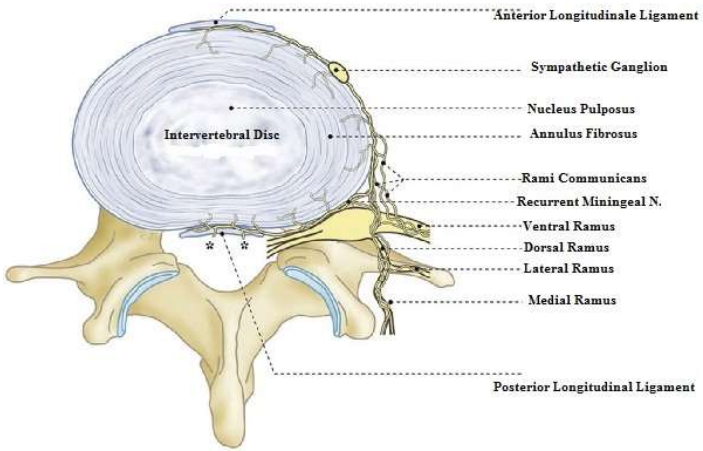
Discogenic Pain

- Discogenic pain does not refer to nerve root pain caused by disc herniation.
- Discogenic pain refers to the pain arising from the disc itself

Discogenic Pain



- The outer third of the annulus is richly innervated
- This innervation constitutes the anatomic substrate for discogenic pain

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Discogenic Pain: Clinical Features (IASP : 1994)

- Lumbar spinal pain, with or without referred pain in the lower limb girdle or lower limb; aggravated by movements that stress the symptomatic disc.

Neurostimulation

- Neurostimulation is a pain treatment that delivers low voltage electrical stimulation to the spinal cord to inhibit or block the sensation of pain
- Trial screening to evaluate patient response to neurostimulation is performed prior to committing to a full implant

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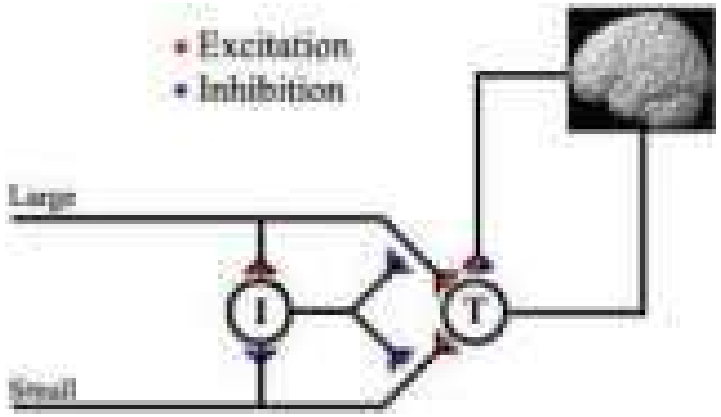
Neuromodulation Theory

- Gate control theory
  - Melzack and Wall (1965)
- Aβ-fibers
  - Myelinated (fast)
  - Light touch
  - Vibratory sense
- C-fibers
  - Unmyelinated (slow)
  - Pain



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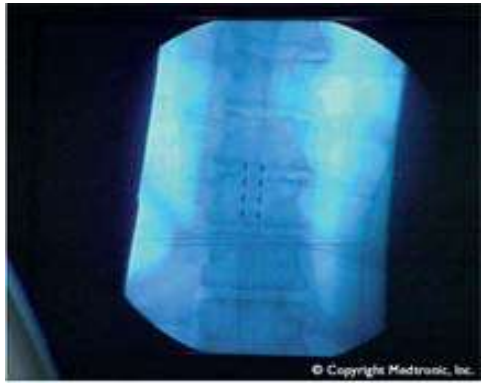
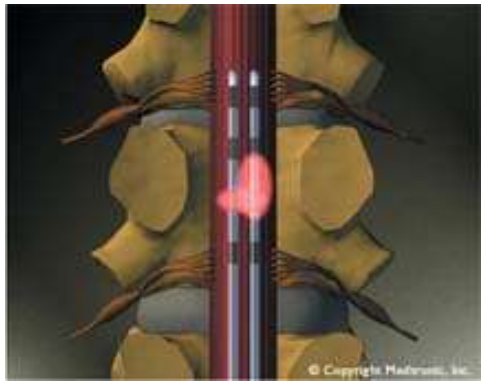
Overview of Trial Procedure

- A percutaneous lead is positioned in the epidural space on the dorsal aspect of the spinal cord at the appropriate nerve root level(s).
- Electrical current from the lead generates paresthesias that can be adjusted in intensity and location to achieve the best pain coverage.
- Leads are attached to an external pulse generator (screener) which supplies the current.
- Patients can use the screener to adjust stimulation to meet pain management needs.





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Indications for Neurostimulation

Most Common Indications for Neurostimulation[1-3]

FBSS-associated chronic pain

Refractory neuropathic back and leg pain

Complex Regional Pain Syndrome RPS) Types I and II

Neurostimulation is perhaps best utilized for the treatment of neuropathic pain of peripheral origin vs. nociceptive origin.[1,2]

1. Meyerson BA, Linderoth B. *Neurol Res*. 2000;22:285-292. **2.** Gybels J et al. *Eur J Pain*. 1998;2:205-[illegible]. De Andrés J, Van Buyten J-P. *Pain Practice*. 2006;6:39-45.

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Patient Selection

- Objective evidence of pathology
  - Use appropriate diagnostic studies to establish pain etiology; to rule out other causes such as a tumor
- Inadequate pain relief and/or intolerable side effects after treatment with more conservative therapies
- Psychological evaluation
  - Is the patient physically and mentally able to handle the procedure and associated maintenance and/or follow-up?
- Absence of drug-seeking behavior
- Patients with predominant nociceptive pain may not respond to treatment with neurostimulation

- Potentially adverse psychosocial factors should also be considered prior to treatment with neurostimulation:
  - Non-compliance to treatment
  - Severe depression
  - Untreated drug dependency

Factors Associated with Success

Clinical Factors:

- Pain etiology
- Treating as early as possible
  - Evidence suggests early intervention yields better efficacy[1]
- In FBS, consider neurostimulation before re-operation[1-4]
- Successful screening trial
- Matching patient energy demand and pain coverage needs with device selection

Individual Patient Attributes:

- Knowledge about neurostimulation and what to expect in terms of pain relief
- Support system (i.e., family, friends)
- Ability to operate implanted device (trialing, recharging, patient programmer, etc)

1. Kumar K et al. *Surg Neurol*. 1998;50:110-121. **2.** De Andrés J, Van Buyten J-P. *Pain Practice*. 2006;6:[illegible] **3.** North RB et al. *Neurosurgery*. 2005;56:98-107. 4. Stojanovic MP, Abdi S. *Pain Physician*. Vol. 5, No. [illegible]

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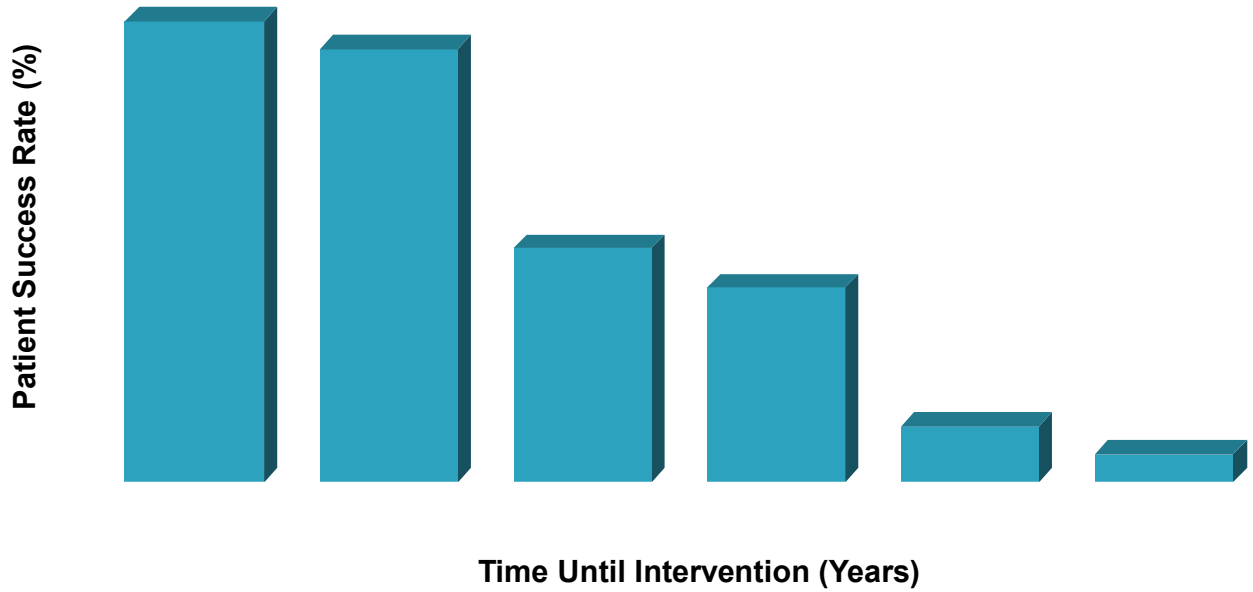
Advantage of Earlier Intervention

A retrospective study showed an inverse relationship between the onset of the chronic pain syndrome and SCS therapy success.[1]



[1] [illegible]er K et al. *Neurosurgery*. 2006;58:481-496.

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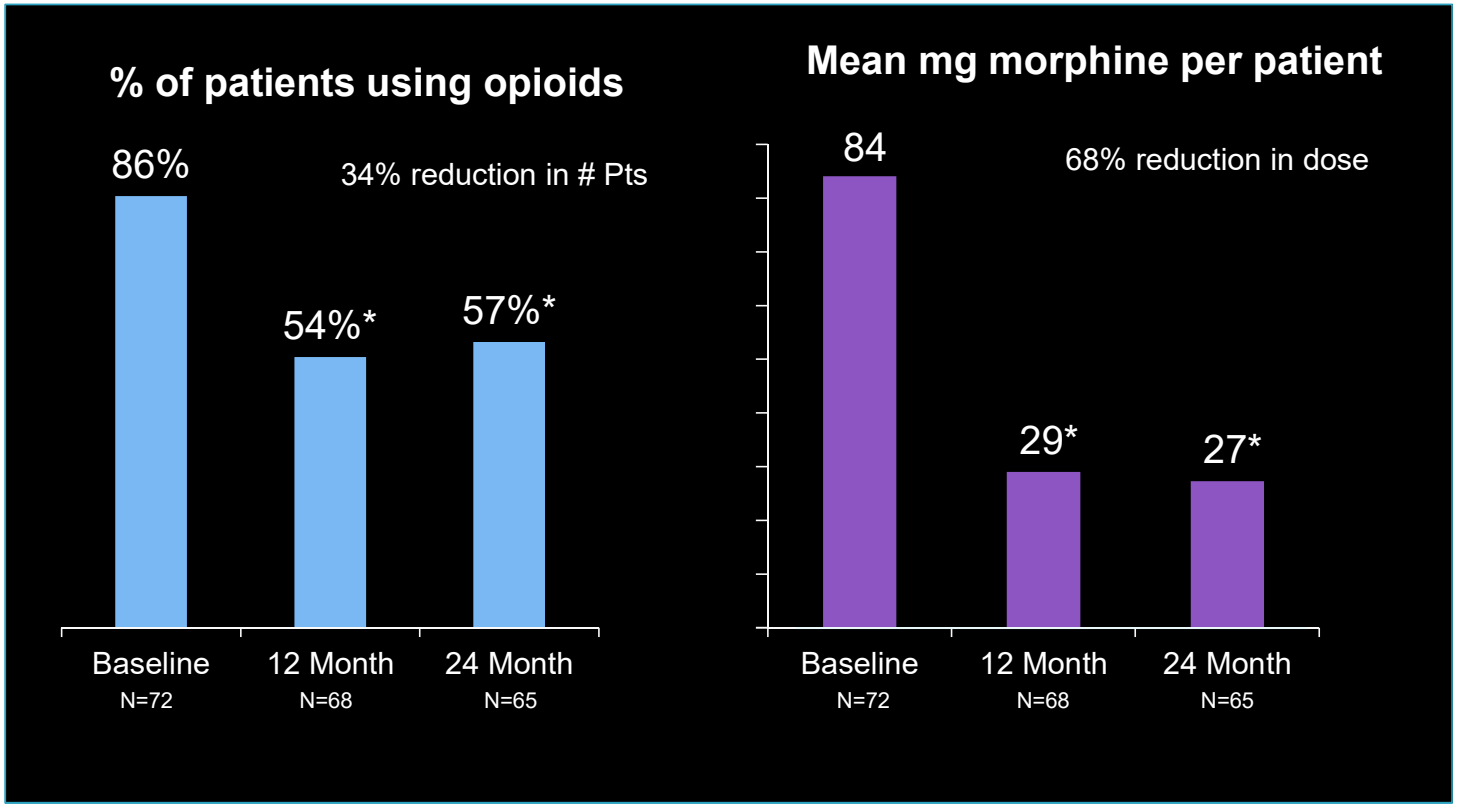
HF SCS: Decreased Opioid Use from 84mg to 27mg



Kapural et al. (Senza trial) Anesthesiology 2015

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Multimodal and multidisciplinary therapies helped reduce pain and improve function more effectively than single modalities.
Multimodal therapies should be considered for patients not responding to single-modality therapy, and combinations should be tailored depending on patient needs, cost, and convenience.

Multiple Modalities, and flexible approach used in all Chronic Disease States, e.g. DM, HTN, depression …and the same applies to our chronic pain patients.

Despite a multimodal approach, we rarely achieve best outcomes, but we should be able to lower doses in chronic conditions.

http://jama.jamanetwork.com/article.aspx?articleid=2503508 *CD Guides 2016*

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Interventional Treatments

- Fluoroscopic guidance intervention has improved the efficacy and safety of many interventions.
- It provides for safe and accurate therapeutic injection and is associated with an exceedingly low frequency of untoward sequelae.

Epidurography and Therapeutic Epidural Injections: Technical Considerations and Experience with 5334 Cases. Blake A. Johnsona, et al.

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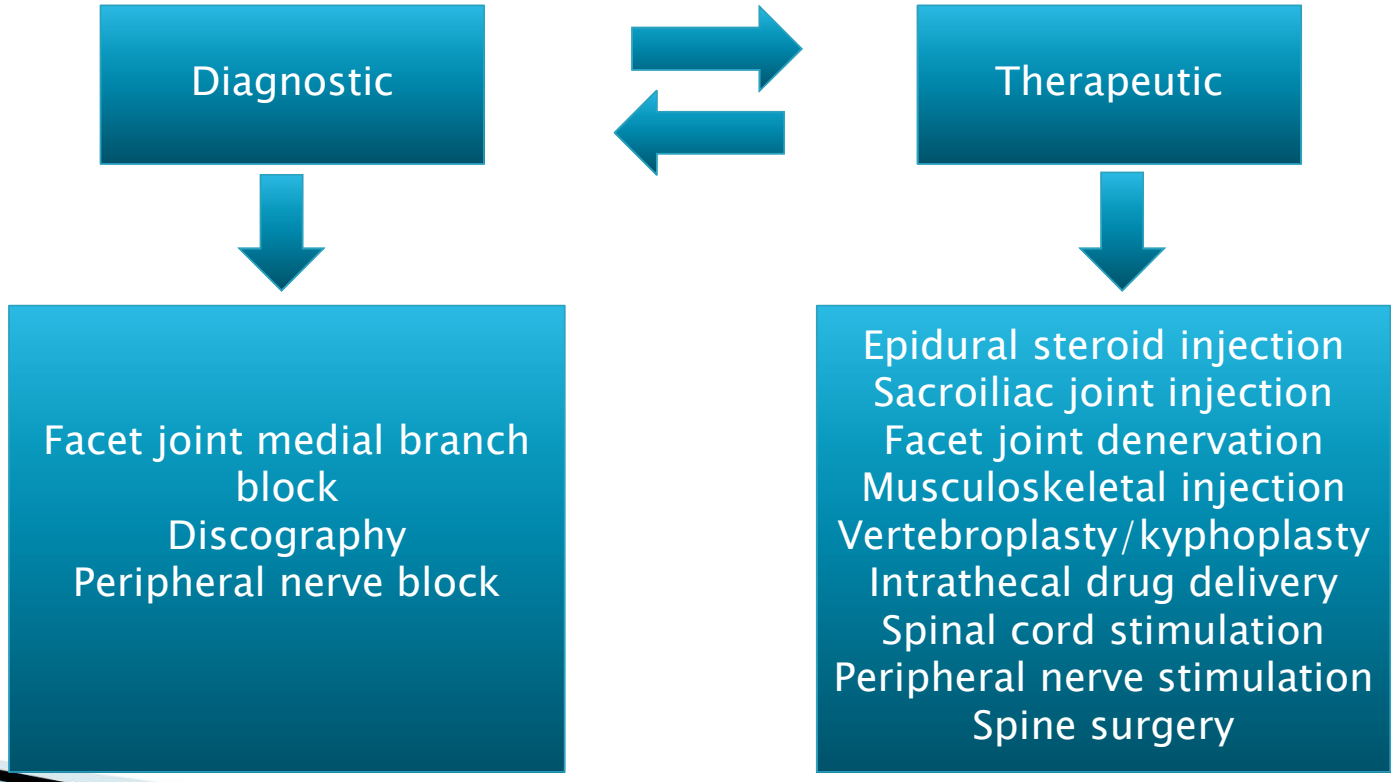
Interventional Treatments



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Behavioral/Psychological Therapies

- Approximately 27% of patients with pain in primary care clinics meet criteria for major depression.
- Rates of depression and anxiety disorders in the Pain Clinic (57.1% and 23.2%, respectively.

Bair MJ, Robinson RL, Katon W, Kroenke K. Depression and pain comorbidity: a literature review. *Arch Intern Med.* 2003;163:2433-2445.

Chronic pain and psychiatric morbidity: a comparison between patients attending specialist orthopedics clinic and multidisciplinary pain clinic. Wong, et al.

Behavioral/Psychological Therapies

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Behavioral/Psychological Therapies

- Pharmacological treatment for depression and anxiety.
- Cognitive behavioral therapy.
- Operant therapy.
- Biofeedback.
- Self help group.
- Addiction therapy.

Spinal Manipulative Therapy

- Documented in writings from China in 2700 B.C. and from Greece in 1500 B.C.
- Is it Safe?
- Spinal manipulation vs mobilization.
- More effective with standard medical care.

Adding Chiropractic Manipulative Therapy to Standard Medical Care for Patients With Acute Low Back Pain: Results of a Pragmatic Randomized Comparative Effectiveness Study. Goertz, Christine M. DC, PhD, et al.

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Physical & Occupational Therapy

- PT/OT focus on client-centered care and promoting optimal independence and satisfaction with performance.
- Education.
- Functional goal setting.
- Pacing activities.
- Ergonomic assessment.
- Manual therapy.
- TENS, heat/cold modalities.

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Integrative Medicine

- Dietary therapy
- Massage therapy
- Yoga/meditation
- Accupuncture
- Regenerative injection therapy

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Reality of Pain in 2016

- Opioids alone may not be the answer
- Because of the complexity of the pain system:
  - Multi-modal approach is preferred: PT, Meds, interventions, CBT
  - Simultaneous multiple therapeutic targets
  - Long-term expectations should be tempered
  - Tachyphylaxis is expected, requires agility, customization
- Basis for early intervention
  - Shingles eruptions and RSD
  - Knee pain, shoulder and hip pain 4 weeks after surgery for injury
  - Work Injuries
  - Compression fractures

Here is why EARLY referrals are critical

Delayed interventions = Poor outcomes

- Facet RF: Cohen et al. CJP 2007
- Spine surgery: Quigley. Surg Neurol 1998, Jacobs Eur Spine J 2011
- Epidural steroids: Kwon et al. Skel Radiol 2007, Benzon Pain 1984
- Pharmacotherapy for CRPS: Perez et al. Pain 2003
- IA injections for knee OA: Tanaka et al. Rheum Int 2002
- Physical therapy for DJD: Jansen et al. Eur J Phys Rehabil Med 2010
- Vertebroplasty: Ryu & Park J Korean Neurosurg Soc 2009

TAKE HOME MESSAGE: INTERVENE EARLY

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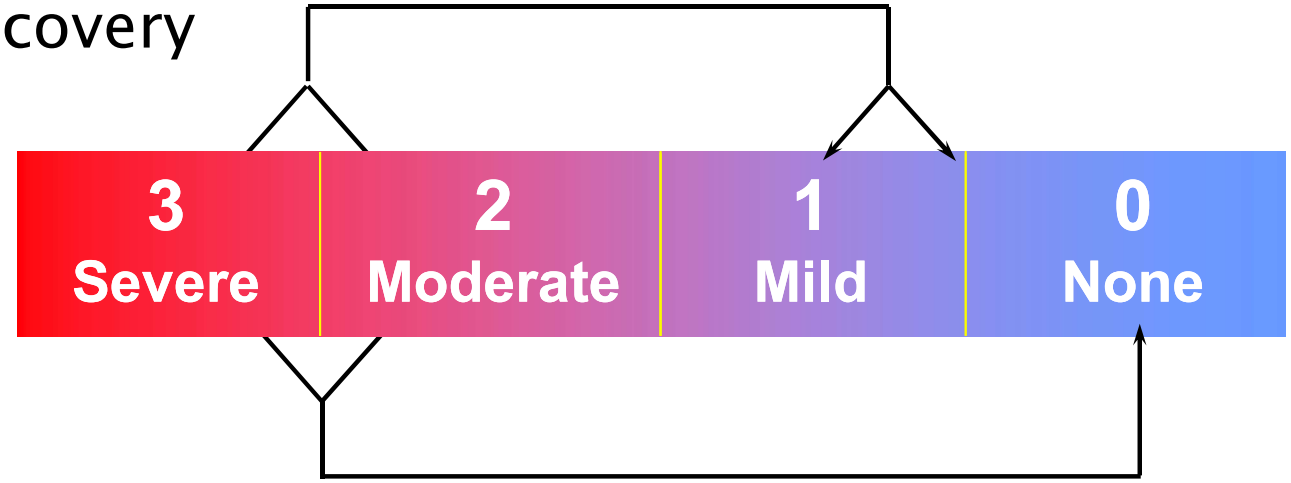
Just as with any other disease, we ought to have tempered expectations for the chronic pain patient

Late referrals…lessen chances for functional recovery



EARLY referrals…improve chances for functional recovery

Ahrens SP, et al. Efficacy and Safety of Rizatriptan Wafer for the Acute Treatment of Migraine. *Cephalagia.* 1999;19:525–300.

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Take Home Messages

- Utilize multimodal approach because CBT, adjuvants, PDMP, UDTs, interventions, implantable can collectively decrease opioid overdose and deaths

- Interventional pain clinics do much more than injections
  - Early on: Interventions are an alternative to opioids
  - Later on: Interventions facilitate an opioid taper or decrease

Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. MMWR Recomm Rep 2016;65:1-49. DOI: http://dx.doi.org/10.15585/mmwr.rr6501e1

http://www.cdc.gov/drugoverdose/prescribing/resources.html

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